H. C. H. WALSH.

AUTOMATIC FEED MECHANISM FOR PUNCH PRESSES.

APPLICATION FILED APR. 7, 1921.

1,406,310. Patented Feb. 14, 1922.

5 SHEETS—SHEET 1.

Fig. 1

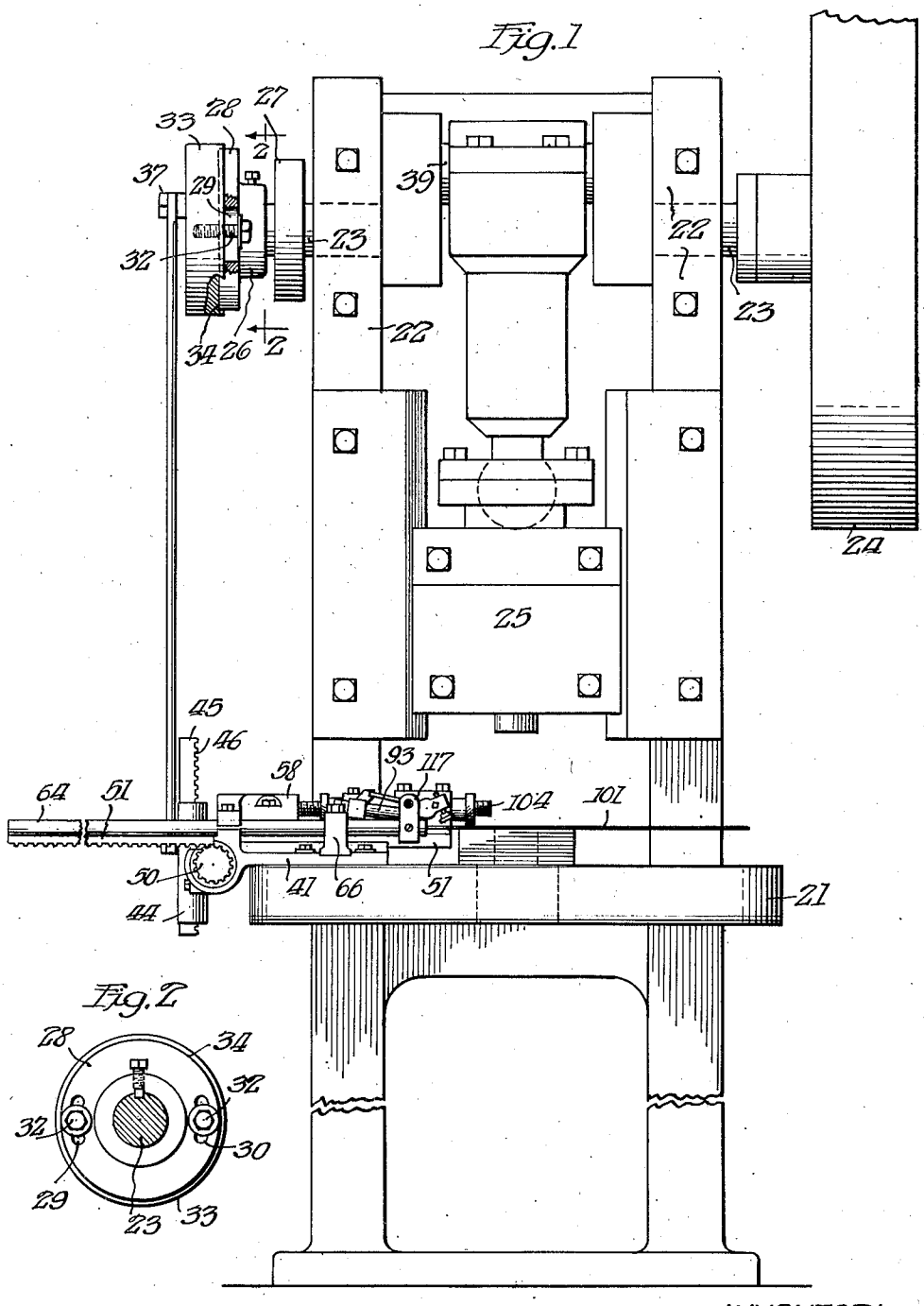


Fig. 2

INVENTOR:
HARRY C. H. WALSH,
BY Fisher Towle Clapp & Soans.
ATTYS.

H. C. H. WALSH.

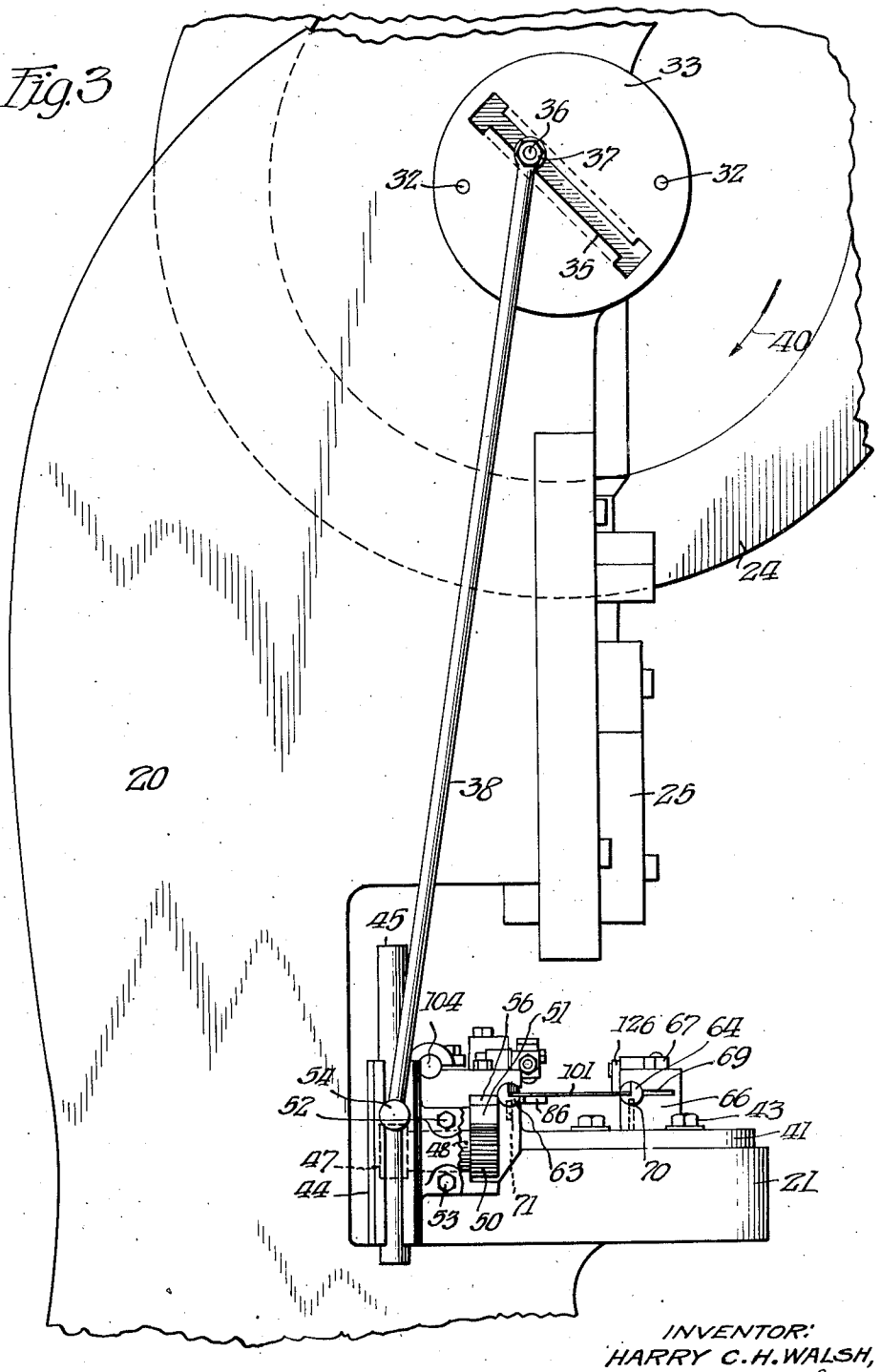
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Fig. 3



INVENTOR:
HARRY C. H. WALSH,
BY Fisher Towle Clapp & Sears
ATTYS.

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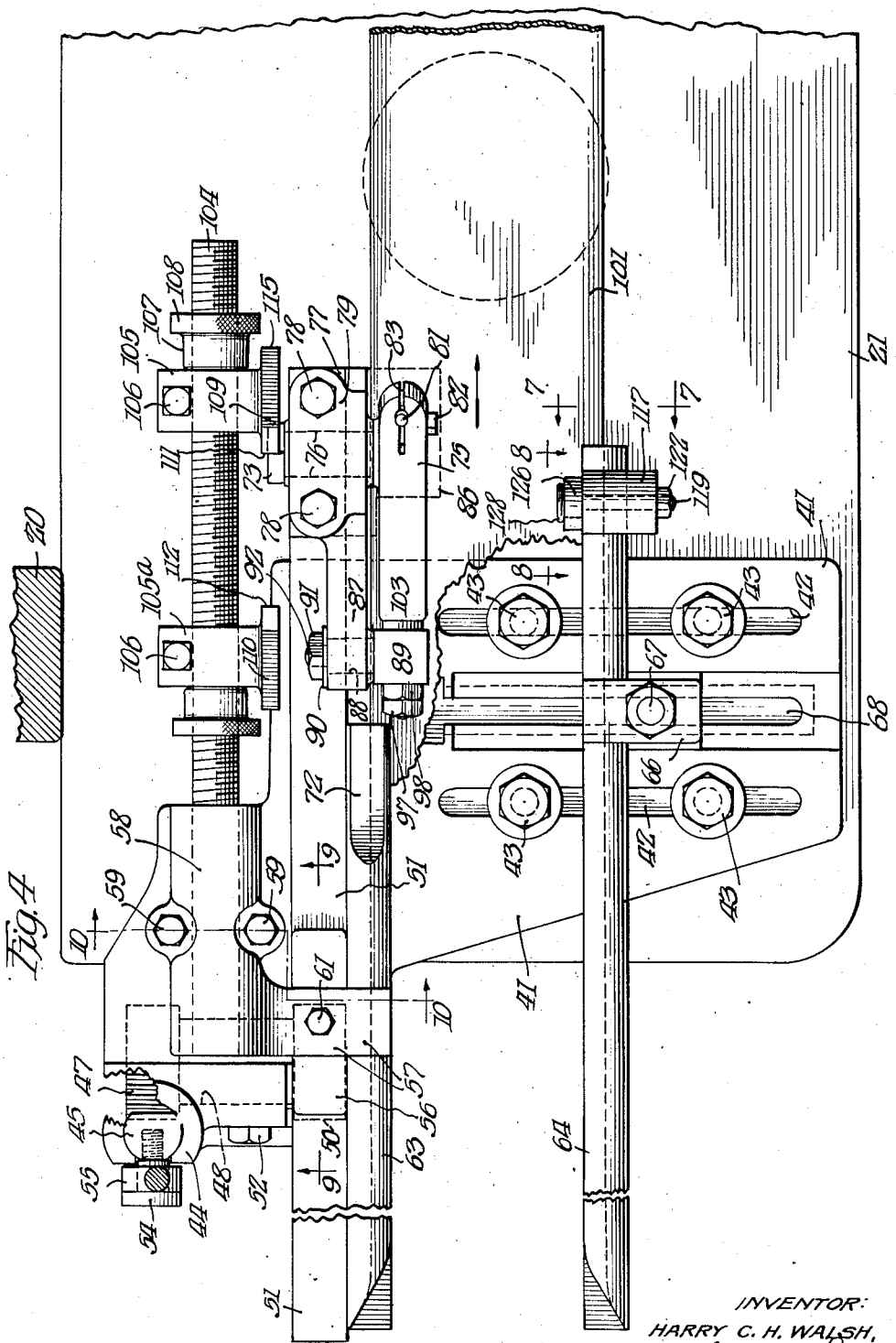


Fig. 4

INVENTOR:
HARRY C. H. WALSH,
BY Fisher Towle Clapp & Soans
ATTYS.

H. C. H. WALSH.

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5 SHEETS—SHEET 4.

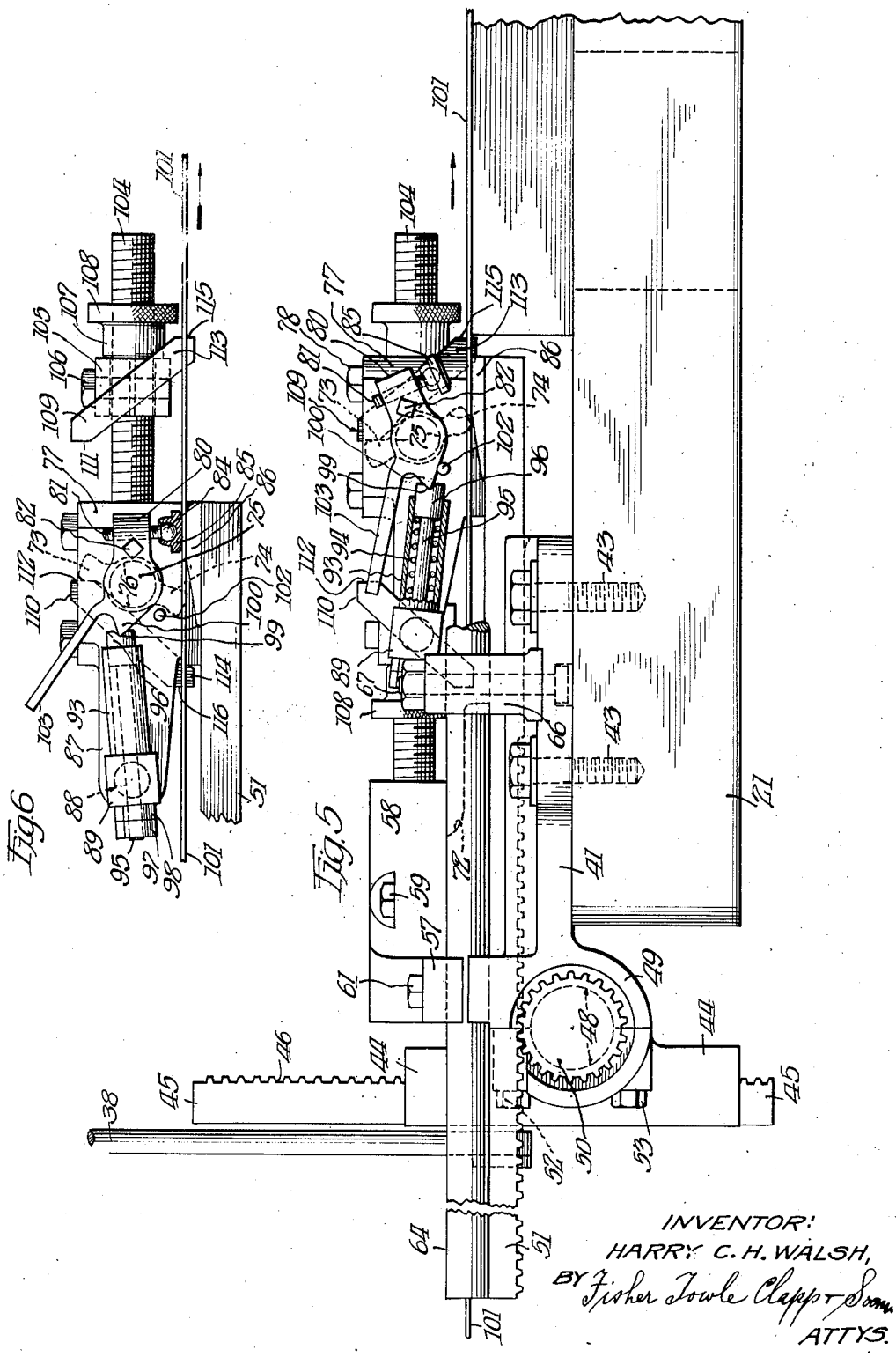


Fig. 6

Fig. 5

INVENTOR:
HARRY C. H. WALSH,
BY Fisher Towle Clapp & Sons
ATTYS.

H. C. H. WALSH.

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5 SHEETS—SHEET 5.

Fig. 7

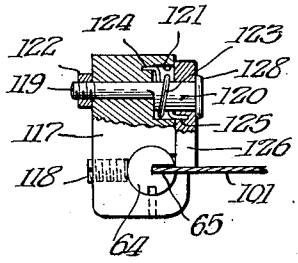


Fig. 8

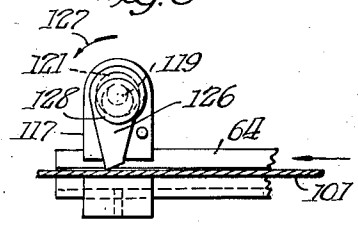


Fig. 9

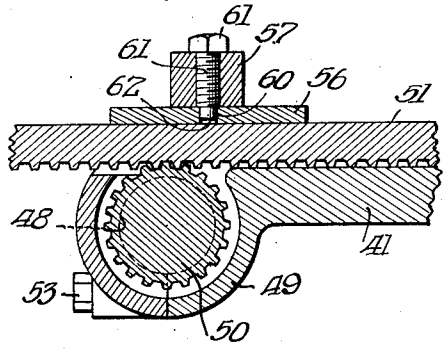
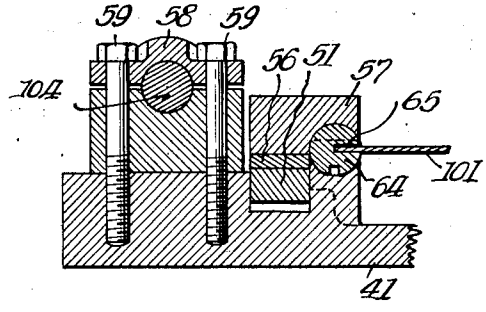


Fig. 10



INVENTOR:
HARRY C. H. WALSH.
BY Fisher Towle Clapp & Sears.
ATTYS.

UNITED STATES PATENT OFFICE.

HARRY C. H. WALSH, OF CHICAGO, ILLINOIS.

AUTOMATIC FEED MECHANISM FOR PUNCH PRESSES.

1,406,310. Specification of Letters Patent. Patented Feb. 14, 1922.

Application filed April 7, 1921. Serial No. 459,377.

To all whom it may concern:

Be it known that I, HARRY C. H. WALSH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatic Feed Mechanism for Punch Presses, of which the following is a specification.

My invention relates to improvements in automatic feed mechanism for punch presses and the like, and has special value for feeding flat stock or strip.

The principal objects of the invention are, to provide an automatic feed mechanism for punch presses and the like, so constructed and organized that it may be employed in connection with various makes, types and sizes of punch presses or similar machines, and for stock of various widths and thicknesses; to provide a mechanism which may readily be adapted to feed the stock in either direction; to provide a mechanism of the class described which may be adjusted with facility and rapidity to suit different classes of work; to provide a mechanism which may be accurately adjusted and which will maintain said adjustment indefinitely; to provide a compact, rugged and substantial construction which will not interfere with the proper work of the machine to which it is attached and which will not obstruct the operator in his manipulation of the press, and, in general, to provide an improved and efficient feed mechanism of the character referred to.

In the drawings, which illustrate my invention as applied to a punch press of standard type,

Fig. 1 is a front elevation of the press, showing my improved feed mechanism applied thereto;

Fig. 2 is a section taken on the line 2—2 of Fig. 1;

Fig. 3 is a side elevation of the parts shown in Fig. 1;

Fig. 4 is an enlarged plan view of the feed mechanism shown in Fig. 1;

Fig. 5 is a front elevation of the feed mechanism as shown in Fig 4;

Fig. 6 is a fragmentary view similar to Fig. 5, showing the parts in a different position;

Fig 7 is a section taken on the line 7—7 of Fig 4;

Fig. 8 is a section taken on the line 8—8 of Fig. 4;

Fig. 9 is a section taken on the line 9—9 of Fig. 4, and

Fig. 10 is a section taken on the line 10—10 of Fig. 4.

Referring to the drawings, 20 represents the main casting or frame of the punch press having the usual bed 21 on which the dies are supported. In the present instance, the main frame 20 is made with two spaced parts extending upwardly to provide bearings as at 22 for the crank shaft 23 of the press. It will be understood that the press has the usual fly wheel 24 and suitable clutch mechanism whereby the head 25 of the press may be caused to descend and ascend when the crank shaft 23 is clutched to the constantly rotating fly wheel 24. Inasmuch as the head, guides, pitman and crank arrangement may be of any standard design and construction, it will be unnecessary to describe said parts in detail.

The feed mechanism receives its movement from the crank shaft 23 of the press so that when the crank shaft is actuated, the feed mechanism is also operated. In attaching or applying the automatic feed to the ordinary punch press, I secure to that extremity of the crank shaft remote from the fly wheel, by means of a key set screw or other suitable screwing means, a hub 24, a plurality of similar hubs 26 bored out to different dimensions serving to adapt the attachment to any size or style of punch press. There is usually room on the end of the shaft outside of the brake 27 to enable the application of the hub 26 to be made to the end of the shaft without any special difficulty.

The hub 26 is preferably made with a standard flange 28, said flange having at opposite sides, a pair of circumferentially extending adjustment slots 29 and 30 through which pass bolts or cap screws 31 and 32, for screwing to the outer face of said flange 28 a crank disc 33. Preferably, the inner face of the crank disc 33 is recessed slightly as indicated at 34 in order to position the crank disc 33 centrally of the shaft axis.

In the outer face of the crank disc 33 there is formed a T slot 35 for accommodating the head of a T head bolt 36 adjustable

along the diametral slot 35, said bolt or screw 36 constituting a crank pin which may be clamped in any desired position of adjustment along the slot 35 by means of a nut 37.

The rotation of the shaft 23 causes an up and down movement or reciprocation of the connecting rod 38, the extent of said throw or movement being determined by the distance of the crank pin 37 from the center of the shaft. The angular position of the feed crank 36 with reference to the angular position of the main crank 39 is such that the rod 38 moves in the proper direction to feed the stock when the punch is raised out of the die. As will appear later, the actual feeding movement may be effected when the rod is descending or when the rod is ascending. Assuming that the feeding movement of the mechanism occurs when the rod 38 is ascending, and assuming also that the crank shaft is rotating in the direction of the arrow 40, the crank 36 will commence to ascend shortly after the main crank 39 has passed beyond its lower dead center and has raised the punch out of the stock. Hence, when the punch press is in the positions shown in Figs. 1 and 2, the crank 36 will be slightly short of its upper limit of movement. It will be understood that the feeding movement of the mechanism occupies substantially 50% of the revolution, while the retractive movement of the feed mechanism occupies substantially the remaining portion of the cycle.

As to the lower portion of the mechanism which is operated by the rod 38, such mechanism is all carried by and is mounted upon a base plate or bracket 41 which is made with a plurality of slots as at 42 accommodating bolts 43 which screw directly into the bed 21 of the press. Said slots 42 extend transversely across the base plate from front to rear so that the entire feeding mechanism may be shifted or adjusted laterally of the direction of stock movement, which movement is in this case from side to side of the press.

Said base plate 41 is formed with a lateral or outer extension having a vertically extending tubular socket 44 in which slides a circular plunger 45. Said plunger 45 has cut on its inner face a series of rack teeth 46 which engage and mesh with the teeth of a spur pinion or gear 47. The gear 47 constitutes one end of a stub shaft 48 journalled in a bearing 49 formed as a part of the base plate 41. On the front end of said stub shaft 48 there is an enlargement 50 on the outer face of which there are cut gear teeth which mesh with a horizontal rack bar 51.

In order to facilitate the insertion of the pinion shaft 48 in its bearing, the base plate extension is preferably made in two parts, the said two parts being connected together by suitable bolts 52 and 53. Preferably the gears 47 and 50 are enclosed in rear and front housings constituting parts of the base plate extension thereby protecting said gears against damage and preventing accidents.

The rod 38 is connected to the vertical plunger or rack bar by means of a pin 54 screwed horizontally into the side of the rack bar 45 and constituting a journal for the enlarged lower end 55 of the actuating rod 38. It will be observed that the outside of the socket or bearing 44 for the plunger 45 is formed with an open slot extending the length of the socket for admitting the shank of the connecting pin 54 and permitting same to move vertically when reciprocated by the rod 38. By means of the rack and pinion mechanism just described, it will be manifest that the up and down reciprocatory movement of the actuating rod 38 will be converted into a horizontal movement of the rack bar 51 in a direction parallel with the desired direction of movement of the strip which is being fed to the dies.

The horizontal rack bar 51 is mounted to slide in a horizontal rectangular channel milled or planed in the upper surface of the base casting 21 (see Fig. 10) and is held down in the proper meshing engagment with teeth of the pinion 50 by means of a shim or plate 56 interposed between the upper surface of said rack bar 51 and the arm 57 of a clamping piece 58 bolted down upon the top of the base plate 41 by means of cap screws 59. The shim plate 56 is located in proper position by the tip 60 of a set screw 61 threaded into and passing through the arm 57. By means of the hexagon head of said set screw 61, the latter may be turned in order to raise the tip 60 of said screw out of the aperture 62 in the shim plate 56 thereby enabling the latter to be withdrawn longitudinally so that the rack bar 51 may be raised a sufficient distance to disengage the teeth of the gear 50. When so disengaged, the rack bar 51 may be shifted longitudinally in order to move the gripper mechanism toward or away from the die of the press. It is of course of some advantage in most cases to grip the stock as closely as possible to the die, so as to insure efficient feeding and to avoid buckling or improper movement of the stock.

The stock in its movement to or from the dies is guided in a pair of parallel guides 63 and 64. As shown in Figs. 7 and 10, each of said guides comprises a circular rod provided with a longitudinal extending radial slot as indicated at 65, the slots facing each other and being of the necessary width to admit freely the edges of the strip which is being fed to the dies. The guide 64 is mounted in a block 66 (see Figs. 3 and 4), which block 66 is clamped to the base plate 21 by a bolt 67. The bolt 67 is equipped with a T head adjustable in a lateral slot 68 so that the guide

64 may be moved toward or away from the guide 63 in order to accommodate different widths of strip.

The guide 64 is clamped in the block 66 by means of the bolt 67, said block 66 for this purpose being split or partially divided by a kerf 69. The guide rod 64 is maintained in proper angular position by a small pin 70 inserted in the base of the block 66 and projecting upwardly into a slot or keyway extending along, and in the under side of, the guide rod 64. It may be stated at this time that the guide rod 63 is also correspondingly maintained in correct angular position by means of a similar pin 71 extending into a similar keyway formed in the under side of guide rod 63. It will be observed that by reason of the keyways extending longitudinally of the rods 63 and 64, the pins 70 and 71 do not interfere with longitudinal movements of the rods 63 and 64 for adjustment purposes.

The rod 63 is clamped in proper position by means of a suitably formed extension of the arm 57, the under side of which is conformed to fit the upper surface of the guide rod. It will be understood that the base plate is also conformed to fit the under side of the said guide rod 63. Preferably, the inner end of the guide rod 63 is milled off, as shown at 72 in order to avoid interference with the parts carried by the reciprocating rack bar 51.

The gripping mechanism which is carried on the inner end of the rack bar 51 comprises as one of its principal parts, a rocking member which takes the form of a unitary steel casting having at one of its ends a pair of diametrically opposed switch arms 73 and 74, and having at the other end thereof a head 75. The intermediate portion 76 of the rocking member is turned off to form a journal which has bearing in a block 77 bolted down upon the inner end of the rack bar 51 by means of cap screws 78, said cap screws also passing through and holding down the cap 79 of said bearing.

The head 75 of the rocker is formed with an arm 80 drilled and threaded to accommodate a screw 81 capable of being clamped in any desired position by means of a set bolt 82 which passes horizontally through the arm 80 such arm 80 being split by a kerf 83 to permit said clamping effect.

The lower end of the screw 81 is enlarged and formed in the shape of a ball 84 constituting one member of a ball and socket joint, the other member of which is formed by a jaw 85, the lower surface of which is substantially flat as shown in Fig. 6. The jaw 85 cooperates with a pad or abutment 86 formed as an integral horizontal front extension of the block 77. The stock is adapted to be gripped between said jaw 85 and abutment 86 by mechanism hereafter to be described. The gripping faces of said parts may be plain or they may be roughened or formed with small teeth if it is desired to operate upon strips opposing considerable resistance to the feeding movement.

The rocker block 77 is made with an arm 87 extending over the rack bar 51, the end of said arm constituting a support for a rock pin 88. Said rock pin 88 is rotatably or oscillably mounted in the end of the arm 87 and is formed at its front end with a rectangular head 89. Said pin 88 is secured in the arm 87 against longitudinal movement by means of a washer 90 and a nut 91 secured onto the reduced threaded extension 92 of the said pin (see Fig. 4).

One side of the rectangular head 89 is provided with a tubular extension 93 for containing a stout compression spring 94, said compression spring 94 surrounding the rod 95 of a plunger, the head 96 of which is acted upon by the spring 94 and slidably fills the open end of the tubular socket 93. The end of the shank 95 of the said plunger extends slidably through the square head 89 and is threaded to receive a pair of lock nuts 97 and 98 for limiting the movement of said plunger 96 due to the spring 94. The end 96 of the plunger is preferably hardened and is made with a transverse notch 99, which notch engages a knife edge 100 formed as a part of the rocker head 75.

The position of the knife edge 100 with reference to the split arm 80 and cooperating parts is such that the spring pressed plunger 96 exerts a strong toggling action causing the rocker to be forced and held strongly in either of its two positions as shown in Figs. 5 and 6. In whichever position the rocker happens to be, it will be held strongly in that position until some outside agency has switched the rocker into the other position against the action of the spring 94. Of course, after the knife edge 100 has been moved past the line or plane connecting the axes of the pin 88 and rock bar 76, the said spring 94 will take hold and complete the movement of the rocker.

Fig. 6 shows the gripping mechanism in the position of clamping the stock 101 between the parts 85 and 86, in which position of the parts the stock and abutment 86 constitute the stop means limiting the angular movement of the rock bar 76. In the other position as shown in Fig. 5, where gripping member 85 is raised out of contact with the stock, the movement of the rocker is limited by a pin 102 fixed in the side of the block 77 and against which the knife 100 strikes. If desired, a finger piece 103 constituting an extension arm over the head 75, may be employed in order to shift or switch the gripper mechanism by hand whenever it is desired to adjust or change the mechanism.

Normally, when the press is running, the rocker which controls the gripping mechanism, is actuated by means of a pair of fixed abutments which are engaged by the switch arm 73 or 74, depending upon whether the mechanism is arranged for pulling the stock from the die, or pushing the stock toward the die. Said abutments or switch blocks are mounted upon a rod 104 extending parallel with the rack bar 51 and having one end thereof secured to the base by means of the clamping block 58 heretofore referred to, it being understood that the upper portion of the base 21 and the under side of the clamping piece 58 are suitably bored out to fit the curvature of the rear end of said rod 104.

The switch blocks or abutments comprise split blocks 105 and 105ª bored out to slide along the rod 104 and adapted to be clamped thereto in any desired position by means of a screw 106. Adjustment of each of the blocks 105 is rendered somewhat more accurate and convenient by threading the rod 104 to receive a circular nut 107 having a milled or knurled head 108. Each of the switch blocks may be identical in construction, except as to its abutment arm, the arm 109 of one of the blocks, in the present instance the right hand one, as shown in the drawings, being inclined downwardly from left to right, while the other abutment arm 110 is inclined in the opposite direction.

Said arms 109 and 110 are made integral with the blocks 105 and 105ª and are dressed off on their extremities to form contact faces 111 and 112 positioned to be engaged by opposite sides of the switch arm 73 when the gripping mechanism is reciprocated by the rack bar 51. It will be manifest, that on account of the face 111 being stationary, when the rack bar 51 moves toward the dies, the switch arm 73, when it engages the face 111, will be thrown in anti-clockwise direction, causing the gripper member 85 to be lifted from the position shown in Fig. 6 and moved into the position shown in Fig. 5. The position of the block 105 is adjusted so as to cause the switching action of the locking bar 75 to occur when the rack bar 51 reaches the end of its effective stroke. Similarly, when the rack bar 51 approaches the end of its retractive movement, the switch arm 73 engages the switch face 112 of the abutment 110 and is thrown into the position shown in Fig. 6 with the gripper member 85 clamping the stock 101 in readiness to move same toward the dies when the rack bar 51 commences to move in that direction.

An important feature of my invention is in so arranging the switch mechanism that the stock may be fed either toward or away from the dies, without the necessity of any extensive reorganization of the mechanism or of equipping the mechanism with additional parts. This is of considerable value, for the reason that in some classes of work it is preferable to draw the stock through the dies, whereas, in other classes of work, it is found more advantageous to push the stock through the press.

To the above end I lengthen the abutment arms 109 and 110 downwardly to form extensions 113 and 114 similar to the arms 109 and 110 except that they are, of course, oppositely located on the blocks 105 and 105ª. Said arms 113 and 114 are formed with abutment faces 115 and 116, which, when the blocks 105 and 105ª are interchanged, are arranged to be engaged by the switch arm 74, which is a duplicate of the switch arm 73, but diametrically opposite thereto.

It will be manifest that when the blocks 105 and 105ª are reversed, the action of the rocker bar 75 will be contrary to its action when governed by the upper switch arm 73. Hence, when the rocker is governed by the switch arm 74 and the lower abutment, the gripper will be moved into inoperative position when the rack bar reaches its limit of movement away from the dies and will be moved into gripping position when the rack bar reaches its limit of movement toward the dies. Hence the stock will be drawn from the die instead of being pushed toward the die, as in the case of the arrangement shown in the drawings.

In order to prevent retrograde movements of the stock, I prefer to employ one or more checking dogs. One of said checking dogs is illustrated in detail in Figs. 7 and 8 and in Fig. 4 is shown as being applied to the inner end of the guide rod 64. The dog is mounted on a block 117 bored out to slip over the circular guide bar 64 and screwed in position by a small set screw 118. The upper end of the dog block 117 is drilled out to receive a pivot pin 119 having an eccentric head 120 located in a recess 121 bored in the inner face of said block 117. The pin 119 is clamped in any desired position of adjustment by means of a nut 122. The recess 121 is of sufficient diameter to receive a coil spring 123 encircling the eccentric head 120, one end 124 of the spring being seated in an aperture of the block 117 while the other end 125 of said spring is seated in an aperture drilled in the side of the dog 126. The effect of the spring 123 is to force the dog 126 constantly in the direction of the arrow 127. It will be understood that the dog 126 is loosely pivoted on the eccentric head 120, lateral movement of the dog being prevented by means of a flange 128 formed on said head. The purpose of the eccentric head 120 is to enable the dog 126 to be raised or lowered to suit stock of different thicknesses, as it will be obvious that in order to secure the maximum gripping effect, it is de-

sirable to have the dog assume a definite angular position, with reference to the plane of the stock, thus insuring an efficient toggling or cramping action.

It will be observed that the dog 126 and its mounting are arranged to permit feeding of the stock toward the dies. In the event that it is necessary or desirable to draw the stock away from the dies, the block 117 may be removed from the guide bar 64 and placed on the guide bar 63 thus reversing the inclination of the dog 126, and preventing the stock from moving toward the dies. If desired, two or more dogs may be employed, one on the rod 63 and the other on the rod 64. In that case, it will be understood that the dogs must be made in the form of rights and lefts.

The ease of adjustment of the rack bar 51 has already been referred to. This is an important feature, for the reason that in many cases, the die is of considerable size and also it may be necessary to set the parts in such a way as to move the stock a considerable distance at each reciprocation of the gripper mechanism. It is of course usually desirable to grip the stock as close as practicable to the die.

It will also be apparent that the rod 104, which carries the switch abutments may also be moved quickly and conveniently by merely slacking off the bolts 59. The same remarks apply to the guide rods 63 and 64, which can be readily adjusted longitudinally of the stock. The guide bar 64 may also be quickly and conveniently adjusted for different widths of stock by changing the position of the mounting block 66 along the slot 68. The entire base may be moved laterally by means of the bolts 53 and slots 42 in order to align the stock with the dies.

It will be understood that the described details of construction and operation are merely illustrative of a single application of my invention, the scope of which should be determined by reference to the appended claims; said claims being construed as broadly as possible, consistent with the state of the art.

I claim as my invention:

1. In an automatic feed mechanism for punch presses and the like, the combination of a reciprocator movable longitudinally of a strip which is to be fed, a rocker provided with a gripper and carried by the reciprocator, spring means operating upon the rocker and arranged to cause said gripper to clamp the strip to the reciprocator when the rocker is in one of two pivotal positions and for holding the gripper out of gripping engagement with the strip in the other position, a pair of abutments respectively engageable by the rocker upon forward and backward movement of the reciprocator for alternately switching the position of the rocker, and means for reversing the direction of movement of the rocker with reference to the direction of movement of the reciprocator.

2. In an automaatic feed mechanism for punch presses and the like, the combination of a reciprocator movable longitudinally of a strip which is to be fed, a rocker, provided with a gripper and carried by the reciprocator, spring means operating upon the rocker and arranged to cause said gripper to clamp the strip to the reciprocator when the rocker is in one of two pivotal positions and for holding the gripper out of gripping engagement with the strip in the other position, a pair of abutments respectively engageable by the rocker upon forward and backward movement of the reciprocator for alternately switching the position of the rocker and means for reversing the direction of movement of the rocker with reference to the direction of movement of the reciprocator, the arrangement including switch arms carried by the rocker for actuating the latter in cooperation with said abutments, said arms being disposed on opposite sides of the axis of the rocker.

3. In an automatic feed mechanism for punch presses, the combination of a punch press provided with a main shaft and a die bed, a base on said bed, a rack bar mounted to move longitudinally on said base toward or away from the die, gripper mechanism carried by said rack bar and arranged to be thrown into and out of effective gripping engagement when the rack bar approaches its respective limits of reciprocatory movement, a pinion engaging said rack bar and means actuated by the main shaft of the press for rotating said pinion alternately in opposite directions.

4. In an automatic feed mechanism for punch presses, the combination of a punch press provided with a main shaft and a die bed, a base on said bed, a rack bar mounted to move longitudinally on said base toward or away from the die, gripper mechanism carried by said rack bar and arranged to be thrown into and out of effective gripping engagement when the rack bar approaches its respective limits of reciprocatory movement, a pinion engaging said rack bar and means actuated by the main shaft of the press for rotating said pinion alternately in opposite directions, the arrangement including a second pinion partaking of the movement of the first pinion, a substantially vertical rack bar, and crank means on the shaft connected to said vertical rack bar for reciprocating the latter.

5. In an automatic feed mechanism for machines using strip stock, the combination of a machine bed, a base plate movably mounted on said bed, means for adjusting said base on said bed laterally of the de-

sired direction of strip movement, a strip guide on said base, a second guide carried by said base laterally adjustable on the base in a direction parallel with the movement of the base adjustment, a rack bar reciprocable on said base substantially parallel with said first guide and adjacent thereto, a block mounted on one end of said rack bar, gripper mechanism carried by said block, a supporting bar also mounted on said base parallel with the guides, and switch means carried by said bar and cooperating with said gripper mechanism for rendering the latter effective or ineffective to grip the stock as the case may be at the respective limits of the movement of said rack bar.

6. In an automatic feed mechanism for machines using strip stock, the combination of a machine bed, a base plate movably mounted on said bed, means for adjusting said base on said bed laterally of the desired direction of strip movement, a strip guide on said base, a second guide carried by said base laterally adjustable on the base in a direction parallel with the movement of the base adjustment, a rack bar reciprocable on said base substantially parallel with said first guide and adjacent thereto, a block mounted on one end of said rack bar, gripper mechanism carried by said block, a supporting bar also mounted on said base parallel with the guides, switch means carried by said bar and cooperating with said gripper mechanism for rendering the same effective or ineffective to grip the stock as the case may be at the respective limits of the movement of said rack bar, said switch means comprising separate, spaced apart members, individually adjustable along said bar.

7. In an automatic feed mechanism for machines using strip stock, the combination of a machine bed, a base plate movably mounted on said bed, means for adjusting said base on said bed laterally of the desired direction of strip movement, a strip guide on said base, a second guide carried by said base laterally adjustable on the base in a direction parallel with the movement of the base adjustment, a rack bar reciprocable on said base substantially parallel with said first guide and adjacent thereto, a block mounted on one end of said rack bar, gripper mechanism carried by said block, a supporting bar also mounted on said base parallel with the guides, switch means carried by said bar and cooperating with said gripper mechanism for rendering the same effective or ineffective to grip the stock, as the case may be, at the respective limits of the movement of said rack bar, said switch means comprising separate, spaced apart members, individually adjustable along said bar, said rack being individually adjustable on said base longitudinally of the direction of stock movement, an oscillating pinion, driven from the machine, for actuating said rack, and means for adjusting the throw of the pinion.

8. In a device of the class described, the combination of a guide rod provided with a longitudinal channel therein for receiving the edge of a strip to be guided, a block fitting said guide and slidable along the same, means for locking said block against such sliding movement, a pin mounted with its axis parallel with the plane of the stock to be guided and provided with a journal, a dog mounted to pivot on said journal, a spring tending to rotate said dog and force the same into engagement with the strip, a shank on said pin passing through said block and rotatable therein and having its axis eccentric with respect to the journal axis and means for locking said pin in different angular positions whereby the center of said journal may be adjusted in height with respect to the guide channel.

HARRY C. H. WALSH.